

process. Opportunities for standardization and enhancement of the informed consent process should be pursued by consensus groups.

#### Impact of Early and Delayed Postoperative Myocardial Infarction on Late Survival in Patients Undergoing Vascular Surgery

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**Objectives:** Perioperative myocardial infarction (MI) has been shown to increase early and late mortality after vascular surgical (VS) procedures. We evaluated the frequency and timing of MI after VS and its impact on survival across a heterogeneous cohort of VS patients.

**Methods:** All patients undergoing a spectrum of VS (open aortic resection, endovascular aneurysm repair/thoracic endovascular aortic repair, carotid endarterectomy/carotid angioplasty and stenting, or lower extremity bypass) from July 2007 to May 2012 were included. MI was diagnosed by electrocardiogram changes, elevated troponin, or diagnosis by a cardiologist. Patients were identified by Current Procedural Terminology code using an institutional patient data research registry consisting of administrative/clinical data and stratified according to the temporal relationship of the MI to the indexed procedure (early:  $\leq 30$  days; intermediate: 1 month to 1 year; late:  $> 1$  year). Univariate and multivariate methods were used to identify predictors of MI and its impact on survival.

**Results:** We identified 2984 patients who underwent VS during the study interval. Early MI was observed in 110 (3.7%), intermediate MI in 66 (2.2%), and late MI in 136 (4.5%). Patient age per year (odds ratio [OR], 1.02; 95% confidence interval [CI], 1.0002-1.05;  $P = .03$ ) and history of coronary artery disease (CAD; OR, 4.6; 95% CI, 2.8-7.5;  $P < .01$ ) independently predicted risk of early MI. Intermediate MI was predicted by history of CAD (OR, 3.2; 95% CI, 1.9-5.3;  $P < .01$ ) and diabetes (OR, 1.7; 95% CI, 1.1-2.7;  $P = .02$ ). Procedure type was not predictive of perioperative or delayed MI. Patients who had an MI within the first year had a lower (log-rank  $P < .001$ ) survival at 1 year ( $77\% \pm 3\%$  vs  $92\% \pm 1\%$ ) and 5 years ( $61\% \pm 5\%$  vs  $71\% \pm 2\%$ ; Fig). Risk-adjusted (age, gender, CAD, race, hypertension) Cox regression modeling showed that early MI (HR, 1.5; 95% CI, 1.01-2.2;  $P = .04$ ) and, more importantly, intermediate MI (HR, 2.2; 95% CI, 1.5-3.2;  $P < .01$ ) independently predicted increase in late mortality, whereas late MI had no impact (HR, 1.03; 95% CI, 0.7-1.6;  $P = .9$ ).

**Conclusions:** The incidence of MI within the first year after major vascular procedures remains low yet is predicted by a history of CAD and diabetes. Readily identifiable high-risk patients should have focused intensive medical therapy before and after VS.

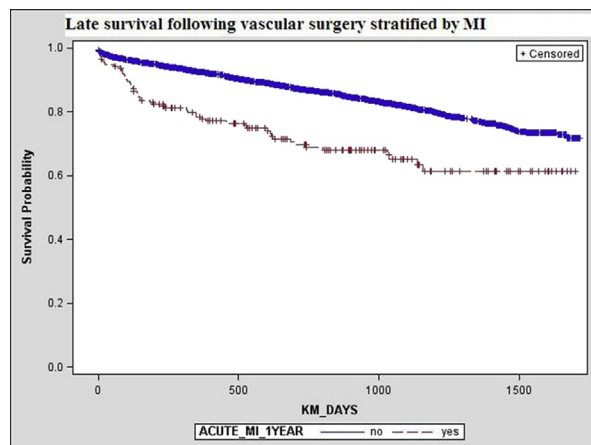


Fig. Late survival in vascular surgery patients stratified by MI.

#### Outcomes of Reoperative Open or Endovascular Interventions to Treat Patients With Failing Open Mesenteric Reconstructions for Mesenteric Ischemia

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**Objectives:** Outcomes of reinterventions for failing open mesenteric reconstructions (ORs) have not been described. Reoperative ORs (R-ORs) can be challenging because of excessive scar and more advanced mesenteric disease. The purpose of this study was to evaluate outcomes of R-ORs and endovascular revascularizations (ERs) in patients with stenosis or occlusion of ORs.

**Methods:** We reviewed a cohort of 593 patients treated for chronic mesenteric ischemia (CMI) in two academic centers from 1991 to 2013. Clinical data and outcomes of patients treated for failing ORs with R-ORs or ERs were included in the analysis. Case-control propensity score matching was used to analyze outcomes of R-ORs compared with patients who underwent their first-time ORs for CMI. End points were early and late mortality, morbidity, patency rates, and freedom from symptom recurrence and reintervention.

**Results:** There were 47 patients (5 male, 42 female; mean age,  $58 \pm 13$  years) treated by reinterventions for failing ORs. Clinical presentation was CMI in 38 patients (81%) or acute mesenteric ischemia (AMI) in nine (19%). Reinterventions included R-ORs in 28 patients (19 CMI and 9 AMI) and ERs in 19, all for CMI. Early mortality was 22% in patients treated by R-ORs for AMI. There were no early deaths among patients treated for CMI with R-OR or ER. Early morbidity was 78% for R-ORs in patients treated for AMI. Morbidity was significantly higher for R-ORs than for ERs in patients with CMI ( $68\%$  vs  $16\%$ ;  $P < .001$ ). Mean follow-up was  $50 \pm 60$  months. Patient survival at 5 years was  $60\% \pm 8\%$  for the entire cohort. Primary and secondary patency at 1 year was  $61\% \pm 10\%$  and  $92\% \pm 8\%$  for R-ORs and  $77\% \pm 10\%$  and  $100\%$  for ERs, respectively, ( $P =$  not significant). Freedom from symptom recurrence and reinterventions at 1 year was  $88\% \pm 6\%$  and  $87\% \pm 7\%$  for R-ORs and  $83\% \pm 8\%$  and  $71\% \pm 10\%$  for ERs. Using propensity score matched comparison, R-ORs were associated with similar mortality, morbidity, patency, recurrence, and reintervention rates compared with first-time ORs.

**Conclusions:** Reinterventions for failing open mesenteric reconstructions using R-OR or ER interventions carry similar mortality, patency, recurrence, and reintervention rates. Early morbidity is significantly lower with endovascular compared with R-ORs performed for CMI. Outcomes of R-ORs are similar to those obtained with the first time ORs in patients with CMI.

#### Multicenter Experience With Retrograde Open Mesenteric Artery Stenting via Laparotomy for Treatment of Acute and Chronic Mesenteric Ischemia

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**Objectives:** Retrograde open mesenteric stenting (ROMS) via laparotomy was introduced as an alternative to surgical bypass in patients with acute mesenteric ischemia (AMI). The purpose of this study was to evaluate the indications and outcomes of ROMS for treatment of acute and chronic mesenteric ischemia (CMI).

**Methods:** We reviewed the clinical data and outcomes of all consecutive patients treated by ROMS in seven academic centers from 2001 to 2013. ROMS was performed via laparotomy with retrograde access into the target mesenteric artery and stent placement using a retrograde or antegrade approach, or both. End points were early and late ( $> 30$  days) mortality, morbidity, patient survival, patency rates, and freedom from symptom recurrence and reintervention.

**Results:** There were 54 patients, 13 male and 41 female, with mean age of  $71 \pm 11$  years. Indications for ROMS were AMI in 44 patients (81%) and CMI with flush mesenteric occlusions in 10 (19%). Four celiac axis lesions and 53 superior mesenteric artery lesions were treated by stenting. The mean stent length was  $42 \pm 25$  mm. Retrograde mesenteric access was used in all patients, but 16 required a simultaneous antegrade approach. The retrograde puncture was closed primarily in 35 patients or with patch angioplasty in 17 and manual compression in one. Bowel resection was needed in 29 patients (54%) with AMI because of perforation or gangrene. Technical success was 98%. One patient was treated by bypass because an attempted ROMS failed. Early mortality was 41% (18 of 44) for AMI and 10% (1 of 10) for CMI ( $P < .01$ ). Early morbidity was 73% for AMI and 50% for CMI ( $P < .01$ ). Mean follow-up was  $11 \pm 19$  months. Patient survival at 1 year was  $36\% \pm 11\%$  for AMI and  $68\% \pm 12\%$  for CMI ( $P = .29$ ). For the entire cohort, primary and secondary patency was  $65\% \pm 11\%$  and